



Quiz # 1
 Math 101-Section 011 Calculus I
 6 October 2016, Thursday
 Instructor: Ali Sinan Sertöz
Solution Key



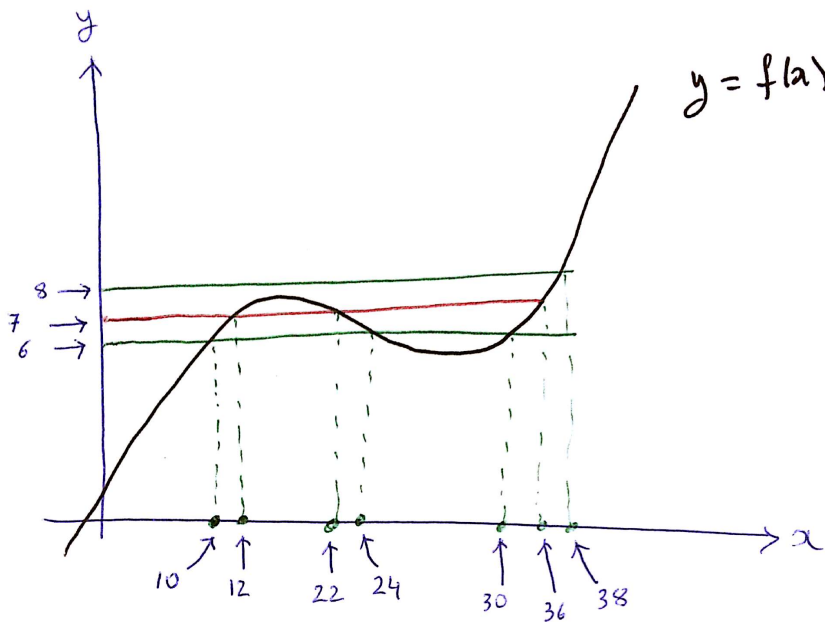
Bilkent University

Your Name:

Student ID:

Your Department:

Show your work in detail. Correct answers without justification are never graded.



Q-1) Using the above graph, find a $\delta > 0$ such that whenever we have $|x - 36| < \delta$, it is guaranteed that we will have $|f(x) - 7| < 1$. Explain how you found your δ . (5 points)

Answer: We solve this from the figure. Every x in the open interval $(30, 38)$ satisfies the inequality $|f(x) - 7| < 1$. Since we want a symmetric open interval around the point 36, we can take any δ satisfying $0 < \delta \leq 2$. In that case the open interval $(36 - \delta, 36 + \delta)$ will be totally included in the interval $(30, 38)$ and the required condition will be satisfied.

Q-2) Is there a number which is 1 less than its cube? (5 points)

Answer: This is equivalent to asking if $f(x) = x^3 - x - 1$ has a real root or not.

We notice first that f is a polynomial so is continuous everywhere. Hence the Intermediate Value Theorem applies.

Then we easily calculate that $f(0) = -1 < 0$ and $f(2) = 5 > 0$. By the Intermediate Value Theorem, f must have a root somewhere in the interval $(0, 2)$. Say this root is a . Then $a = a^3 - 1$.

In fact $a = 1.324717957\dots$

Here is the graph of f .

